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Behaviour and Attitude Farmers Pro-Environmental: Confirmatory Factor Analysis

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The most important goal in this study is to look at the most dominant factors that influence attitudes and behaviour in using chemical fertilizers and pesticides by farmers. The study was in Maros Regency, South Sulawesi Province. The population in this study was the farming community, especially soybean farmers, the number of samples used was 200 respondents. Confirmatory Factor Analysis (CFA) is an analysis used in research with the IBM AMOS Program. From the results of the study, it found that the habits of using chemical fertilizers and pesticides were still being carried out by farmers in farming, even though they had cultivated for generations. The action or behaviour of this farmer's culture is based on the desire of farmers to meet the needs, as well as the drive to achieve the maximum target for the quantity of products produced. Therefore, the use of chemical pesticides to eradicate pests will still use. Land processing behaviour and affective attitudes of farmers are the most significant factors that influence the behaviour and attitudes of farmers in determining their way of farming.

KEYWORDS

Agroecology, Chemical Fertilizers, and Pesticides, Pests and Diseases, Sustainable Agriculture

1. INTRODUCTION

Beginning with the adoption of the conventional agricultural management model in 1970 in Indonesia, the technology of using chemical fertilizers and pesticides began to be applied by farmers. Concretely, this technology is indeed considered successful in increasing production and even doubling agricultural production to achieve food self-sufficiency targets [1]. Since then the interest of farmers in using this inorganic material has been increasing and based on the observations of almost all farmers depend on these two artificial ingredients [2]. Likewise, with farmers, pest attacks on plants so far often cause anxiety among farmers because the level of attack both during the growth phase and when the plant enters the generative phase causes a decrease in the quantity and quality of production and sometimes if the handling of controls not maximized, the output of crops is damaged and farmers will experience crop failure [3,4].

Efforts to control pests and diseases in plants, farmers generally prefer to eradicate pests and diseases by chemical means by using chemicals such as chemical fertilizers and pesticides [4]. This chemical method commonly used by farmers and is still the first choice for farmers [5]. The reason; 1) Because this chemical method using chemical pesticides is one way that is considered comfortable and practical by farmers because it can instantly eradicate pests; 2) Chemical pesticides used by farmers can be obtained easily in nearby stores and; 3) Every year farmers get chemical pesticides in the form of subsidies from the Government.

The use of fertilizers, to increase the fertility of the land, the farmers use more often to use chemical fertilizers than organic manure in managing their agricultural business, the reason is; 1) Chemical fertilizers according to farmers are available, are everywhere and can easily be directly used by farmers, 2) Chemical fertilizers are considered by farmers to respond faster and provide growth effects and higher production rates than organic fertilizers, 3) Farmers' tendency to make Organic fertilizer is still relatively low, this is because, in addition to the limited level of knowledge, it is also supported by the flat response of organic compost to plant growth and production [6,7].

In general, the decline in land productivity shows that the land degraded. It estimated that around 2 billion hectares of land has degraded and 75% are in the tropics including in Indonesia. It preceded by the presence of symptoms of saturation on earth that receives inorganic input continuously to destroy underground biodiversity. Further impacts include disruption of the soil decomposition process by soil microorganisms to cause soil density. Solid land can no longer guarantee optimal production results so that the consequences of crop production will decrease.

Indications of the impact are among others; many farmers use chemical fertilizers and pesticides to experience health problems because they do not use masks during application, in addition many crop production produced by farmers such as fruits and vegetables are now saturated with chemical substances because they often receive chemical pesticides, so most fruits and Vegetables have been contaminated directly with fertilizer residues and chemical pesticides which are very dangerous to health, so they are no longer suitable for consumption [4]. On the other hand, the use of excessive chemical pesticides and fertilizers, as well as the handling of toxic waste that is not in place, is considered to contribute to the pollution of the agricultural environment to reduce land productivity [8].

Realizing the above, to safeguard the environment, the safety of humans and other living things, as an alternative, the Government is developing an organic farming management system by reducing the use of chemical inputs, through the implementation of sustainable agriculture based on the principle approach agroecology [3]. The elaboration of this agroecology-based sustainable agriculture management system tends to emphasize to farmers to abandon conventional farming systems and switch to organic farming management models, so that in line with the current development for agriculture paradigm that puts high attention not only on production aspects but as well as paying attention to its ecological aspects [9]. It is intended so that the potential of land resources for agricultural cultivation can continue to be managed and utilized sustainably for current and future generations. The Technical Advisory Committee of the CGIAR [10], states that "Sustainable agriculture is the management of successful resources for agricultural businesses to help change human needs while maintaining or improving environmental quality and preserving natural resources." Furthermore, according to [11], sustainable agriculture is the management of natural resource conservation and is oriented towards technological and institutional changes that are carried out in such a way as to ensure the fulfilment and satisfaction of human needs in a sustainable manner for present and future generations.

Several studies conducted show that individuals who have an ecocentrism attitude tend to pay more attention to environmental problems and are more involved in environmental conservation activities. Conversely, individuals who have anthropocentric attitudes tend to have less attention to environmental issues and rarely carry out conservation or environmental protection activities [12].

Sustainable agriculture considered as one of the measures to protect agricultural land resources (land conservation) through the application of organic farming systems that emphasize the dominance of the use of natural materials as a means of input to increase crop production [13]. It has the potential to be developed, given the many natural ingredients that can be used as organic fertilizers to increase plant nutrients such as rice straw and other natural ingredients [14]. Likewise, to eradicate pests, lemongrass plants, guava leaves. Can be processed into organic matter [1,5]. In a sustainable farming system, the application of natural ingredients as fundamental components of organic fertilizer and pesticide raw materials considered safe and environmentally friendly so that it is safe for environmental health and stability [15,16].

Pesticides can be categorized as risk-reducing inputs because they are inputs that can increase the expectation value of probability results [17]. The use of pesticides can suppress the attack of plant-disturbing organisms so that loss of results can minimized. Pesticide reduction although on the one hand can reduce production costs, but on the other hand it can increase the intensity of attacks by plant-disturbing organisms so that the risk of losing yield is higher [18]. The pesticide itself classified into the type of organism that will be controlled by the population. Insecticides, herbicides, functions, and nematicides are used to control pests, weeds, plant pathogens and nematodes. Other types of pesticides are used to control pests from rats and snails [19,20].

Still related to behaviour or attitudes, several theories used to describe supportive attitudes towards the environment are the Behavioural Design Theory [21,22], and the Model Norms of Activation from [23,24,25]. Recycling measures for used goods in the environment [26], energy conservation [27], wisely buying goods that are pro-environment [28], has been explained using the model. Decision making from farmers has also been tested using these models [29,30].

2. MATERIAL AND METHOD

2.1. Sample and respondent

The study population is those who work directly in the field of agriculture (farmers). Moreover, the other criteria are that the farmer who will use as the respondent has and will use inorganic and organic materials in the farming process. The research respondent's data used were 200 respondents according to recommendations [31] that for SEM analysis 100-200 samples were used. Then the location of the sample display in Maros Regency, South Sulawesi Province by using the Purpose Random Sample method.

Table 1 demographics of the samples used in the study shows the majority of the sex of the respondents are men with a percentage of 67.00%, the age of the most dominant respondents between 41-50 years with a rate of 44.50%, the level of education of the most dominant respondents with a percentage of 63.00% namely primary

school, monthly income of 1-2 million rupiahs with a percentage of 43.50%, and the status of agricultural land is the majority of self-owned land with a rate of 47.50%.

Table 1. Demographics of Research Respondents

Item	Frequency	Percent
Gender		
Man	134.00	67.00%
Women	66.00	33.00%
Age		
20 - 30 year	21.00	10.50%
31 - 40 year	54.00	27.00%
41 - 50 year	89.00	44.50%
Above 50 year	36.00	18.00%
Education		
No School	5.00	2.50%
Primary School	126.00	63.00%
Junior High School	61.00	30.50%
Senior High School	8.00	4.00%
Income / month		
Below 1 million rupiah	36.00	18.00%
1 - 2 million rupiah	87.00	43.50%
2 - 3 million rupiah	45.00	22.50%
Above 3 million rupiah	32.00	16.00%
Status of Agricultural Land		
Right of ownership	95.00	47.50%
Rent	21.00	10.50%
Profit sharing	71.00	35.50%
Pawn	13.00	6.50%

2.2. Measures

Primary data was obtained through direct surveys to farmer communities using instruments in the form of questionnaires which divided into several statement items consisting of positive and negative statements. The study was measured using a measuring instrument in the form of an ordinal scale questionnaire. The Likert scale used as a measurement scale. Likert scale is a scale used to measure a person's or group's perceptions, attitudes or opinions. The Likert scale rating used in research 1 - 5 with details 1 = strongly disagrees; 2 = disagree; 3 = doubt; 4 = agree; and 5 = strongly agree.

2.3. Data analysis

Confirmatory Factor Analysis (CFA) is one-factor analysis method used when researchers know the structure of a latent factor. The structure of the possible element is obtained based on the theoretical study, the results of the research or the hypotheses of the researcher regarding the relationship between variables observed with latent variables. The CFA method is used to test the hypothesis [32,33]. In the study of testing CFA, the IBM AMOS 22 Program used with the process of maximum likelihood estimation.

2.4. Study Model

At the outset of the study, a coherent model incorporating environmental attitudes and behaviour in agriculture was developed based on theoretical consideration of construct and available empirical studies [34,35]. The attitude model in this study based on theory [36], which commonly referred to as the three components of attitude. Some research shows that between attitudes and behaviours are not correlated, or if related then does not indicate the direction of causality relationships [37,38,39]. As a cause, this attitude has three components. In the three-component approach, a position seen as a multidimensional construct, whose constituency consists of cognitive, affective, and conative components. These three components interact with each other to understand, feel and behave towards an object. However, even though the constellation of these three components is in an evaluative continuum, the application can lead to differences.

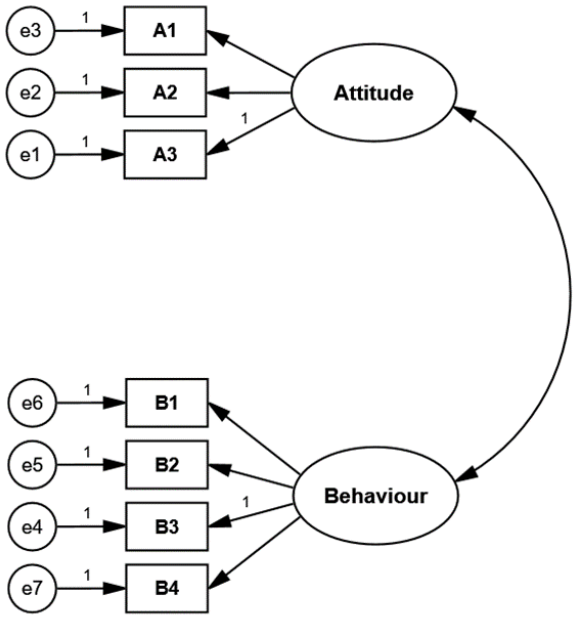

Fig. 1. Path Diagram Research Model

Model testing with CFA is only done to find out the measurement model and not to know the relationship between latent factors [33]. The measurement model shows the relationship between each indicator as a variable observed with the construct that becomes the possible factor that it represents [31]. Explanation of construct along with sub-construct of both variables follows:

Table 2. Construct of Research Variable

Construct	Sub-Construct
Cognitive (B1)	Maintain environmental functions; Appropriate planting; Reducing the use of pollutants.
Affective (B2)	Maintain the health of pollutants; Maintaining an agricultural environment; Reducing the level of environmental pollution.
Conative (B3)	Preventing soil pollution; Prevent water pollution; Prevent air pollution.
Land processing behaviour (B1)	Land preparation; Land processing methods; The purpose of land processing.
Land use behaviour (B2)	Land use model; Purpose of land use; Target land use.
Behaviour of the production process (B3)	Production facilities used; The agricultural system applied; How to grow crops.
Behaviour of land conservation (B4)	Conservation actions in processing land; Conservation actions in utilizing land; Conservation actions in the production process.

3. RESULT AND DISCUSSION

The purpose of CFA is to confirm or test the model, namely the measurement models whose formulation comes from the theory. Thus, the CFA can be said to have two focus studies, namely: (1) whether the indicators are conceptually unidimensional, precise and consistent; (2) what signs are dominant form the construct under study.

In the CFA analysis method, one of the most important things is assessing the Goodness of Fit (GOF). If the Goodness of Fit produced by a model is right, then the model can be accepted and vice versa if the Goodness of Fit generated by the model is terrible, then the model is rejected, or the model must be modified. With the IBM AMOS Program, 25 sizes of Goodness of Fit will be obtained. Schumacher and Lomax [40], recommends reporting only four dimensions, namely Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), Normed Fit Indices (NFI), and Goodness of Fit Indices (GFI).

From the results of the analysis, the Goodness of Fit value for the Root Mean Square Error of Approximation (RMSEA) is obtained at 0.000, which means fit because <0.050 [40,41,42,43,44], Comparative Fit Index (CFI) obtained at 1,000 means fit because >0.900 [40,43,45], Normed Fit Indices (NFI) obtained as 0.981 means fit because >0.900 [40,46], and Goodness of Fit Indices (GFI) obtained for 0.958 means fit because >0.900 [40].

Table 3. The result of factor loading, composite reliability, average variance extracted of CFA analysis items

Variable	Construct	Standardized Factor Loading	Composite Reliability (CR)	Average Variance Extracted (AVE)
Attitude	Cognitive (A1)	0.758	0.752	0.901
	Affective (A2)	0.919		
	Conative (A3)	0.638		
Behaviour	Land processing behaviour (B1)	0.957	0.723	0.850
	Land use behaviour (B2)	0.692		
	The behaviour of the production process (B3)	0.579		
	The behaviour of land conservation (B4)	0.634		

Evaluate the measurement results by observing the standardized factor loading (SFL) value of each item must be greater than 0.500 [31,47], then for the composite reliability (CR) and average variance extracted (AVE), the value obtained must be greater than 0.700 [31,48]. Composite reliability (CR) and average variance extracted (AVE) values obtained for attitude variables of 0.752 (CR), and 0.901 (AVE) then the behaviour variables of 0.723 (CR), and 0.850 (AVE). This result is still more significant than the required value.

Furthermore, in Table 3 also shows the standardized value of the loading factor illustrates the relationship between the research variables and the indicator [31,49,50]. Then the best index on a variable is the one that has the most substantial loading value because it indicates the higher relationship between the indicator and the research

variable. From the results of the analysis obtained the standardized factor loading value for the most top attitude variable is effective to construct with 0.919 then for the highest behaviour variable, namely the soil treatment process with a value of 0.957. The conclusion that can draw is that the most significant influence that affects the attitude of farmers is useful in the method of farming. Land processing is the most significant factor influencing the behaviour of farmers in determining whether to use chemical pesticides or to switch to organic.

Culture will be an external factor to suppress actor or individual action patterns. Individuals are not independent in acting, because all own actions determined by culture. Religion can be transferred from one system to another through diffusion and moved from one person to another through the process of cultural learning, namely: the process of internalization; socialization process; and the enculturation process [51]. Previously in 1843 anthropologists gave the meaning of culture as a way of cultivating the land, farming efforts, as reflected in the term's agriculture and horticulture. Another anthropologist [52], defines the notion of culture that culture is complex which includes knowledge, beliefs, arts, morals, laws, customs, and other abilities and habits acquired by humans as members of society.

Other factors such as norms, beliefs, and ethnicity in individuals are also external factors that can influence a person in determining actions against environmental problems. The value-belief-norm (value-belief-norm) is one form that explains how our behaviour affects when ecological issues arise [53,54,55]. The low level of adoption of pesticide reduction technology in Indonesia is likely due to inadequate knowledge of farmers on the negative impacts of pesticide use. It is inseparable from the lack of intensive counselling given to farmers. Besides, there are still limited cultivars that are resistant to pests, causing farmers to use pesticides higher than recommended. Research results in Illinois, Iowa, Nebraska, and Ohio inform that farmers with better environmental knowledge will be willing to reduce insecticide use. Farmers in the area already consider the long-term benefits of environmental improvement [29], [56]. Hungerford and Volk [57], said that behaviour influenced by a strategy of applying knowledge, knowledge of issues, personality factors, such as attitude, motivation and situational factors.

In connection with this, the attitude or behaviour towards the environment that is related to culture itself can assumed as an individual attitude that is acceptable to the situation. A positive attitude towards the environment is the main reason for the orientation of everyone's attitude toward the environment [58]. Pelletier, et al. [59], suggests that each person influenced by emotional factors, external factors, and motivation for the environment. Because a farmer is an action or behaviour related to the environment. Soybean farmer culture can describe as a form of daily operations or habits of soybean farmers that are carried out in managing soybean farming. It can be observed starting from the way farmers handle land/land processing, handling seeds and seeds, handling planting, handling maintenance (including irrigation, fertilizing and controlling pests), to handling yields and marketing of production. In general, the behaviour of farmers in managing agriculture influenced by several factors; in addition to the level of knowledge that farmers have, it is also affected by experiences, traditions or old habits that have been passed down from generation to generation, local wisdom and motivation of farmers.

At present, the practice of using chemical fertilizers and pesticides is still being carried out by farmers in farming, even though farmers have been handed down for generations. The action or behaviour of this farmer's culture is based on the desire of farmers to meet the needs, as well as the drive to achieve the maximum target for the quantity of products produced. However, the fundamental problems that arise include most farmers who use chemical fertilizers and pesticides, not yet fully understand the application's technical instructions and the negative impacts. The lack of knowledge in applying the use of chemical fertilizers and pesticides has caused farmers to misapplication. Many irregularities by farmers, as well as carelessness that violate the rules of use. Based on the information obtained, in meeting the target needs and desires to achieve production as much as possible, farmers do not hesitate to over-dose, over-concentrated and over-intensity the chemical fertilizers and pesticides on their crops.

Increased agroindustry activities in addition to increasing agricultural production also produce waste from these activities. The use of pesticides, besides being beneficial to increase agricultural production but also have a negative impact on the farming environment and human health. In the application in agriculture, it turns out that not all pesticides are on target. Approximately only 20 percent of pesticides hit the mark while the other 80 percent fell to the ground [20]. The accumulation of pesticide residues results in pollution of agricultural land. When it enters the food chain, the toxic nature of pesticide ingredients can cause various diseases such as cancer, mutations, congenital disabilities, CAIDS (Chemically Acquired Deficiency Syndrome) and so on [60]. Pesticides that cause the most damage to the environment and threaten human health are synthetic pesticides, namely the organochlorine group. The level of damage caused by organochlorine compounds is higher than other compounds because these compounds are sensitive to sunlight and not easily decomposed [61,62].

The behaviour of farmers in managing agricultural land will, of course, vary between one farmer and another. Several factors can cause this difference in response. The predicted factors can affect the behaviour of farmers in managing their agricultural land is the age of the farmer, the last level of education completed by the farmers, the length of farming, the knowledge of farmers about landslide-prone areas and counselling followed by farmers. These factors will influence the behaviour of farmers in managing land which includes land management, nurseries, fertilization and frequency of fertilization, sources of irrigation and frequency of watering, eradication of pests and diseases, a frequency of pesticide administration, weeding, the way farmers prevent erosion and landslides. includes the making of agricultural plots, the use of mulch, the making of mounds/slabs, and the making of sewerage

4. CONCLUSION

The behaviour and attitude of the farmer culture must immediately address because if it is left continuously predicted the volume of pollutants entering the soil, and spread in the waters and air will increase, meaning that the level of pollution of the agricultural environment and its surroundings will increase. This condition will further worsen the quality of the situation so that it feared that it would potentially damage or hamper the agricultural production system to the point of food insecurity. Pollution from pesticide residues is very harmful to the environment and health so that there is a need to control and limit the use of these pesticides and reduce pollution caused by pesticide residues. Global policies were restricting the use of synthetic pesticides that lead to the socialization of clean technology, namely limiting the use of synthetic pesticides for handling agricultural products, especially mainstay commodities for export. In this case, various efforts were made to overcome the adverse effects of pesticides and prevent further pollution.

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